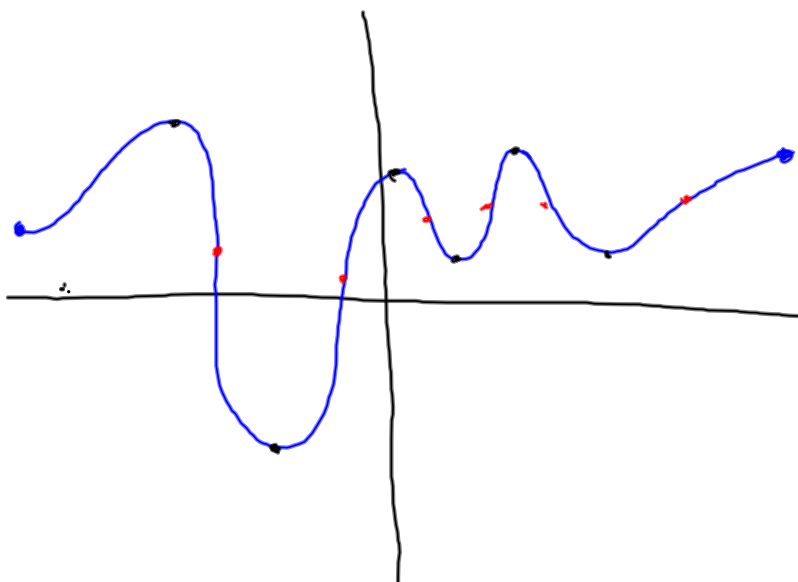


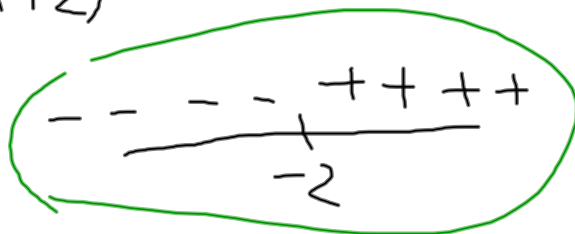
Finding Relative Max & Min



$$y = x^2 + 4x + 4$$

$$\begin{aligned}\frac{dy}{dx} &= 2x + 4 \\ &= 2(x + 2)\end{aligned}$$

-2



- 1st $\frac{d}{dx}$ test
- 1) Take the derivative
 - 2) Find critical points
 - 3) Make a sign graph



$$\frac{d}{dx} = 2x + 4$$

$$y'' = 2$$

+++++

2nd Derivative test

- 1) Take 2nd derivative
- 2) Find critical points
- 3) Make a sign graph

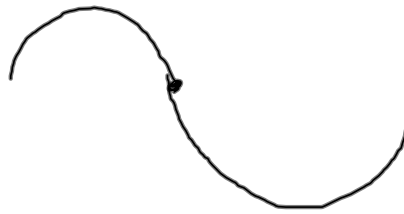
$$y = x^3 - 12x^2 + 48x - 64$$

$$y' = 3x^2 - 24x + 48$$

$$y' = 6x - 24 = 6(x-4)$$

$$x = 4$$

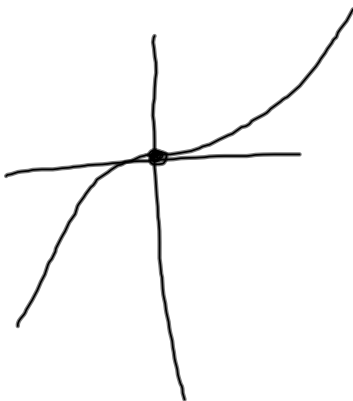
+++++
4



$$y = x^3 - 12x^2 + 48x - 64$$

$$\begin{aligned} y' &= 3x^2 - 24x + 48 \\ &= 3(x^2 - 8x + 16) \\ &= 3(x-4)^2 \end{aligned}$$

+++++
+++++
4

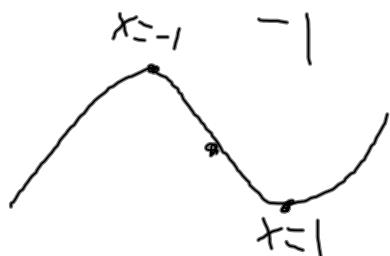
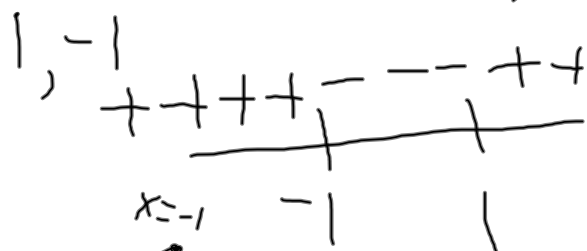


#3 a, b

pg. 305

6.) $x^3 - 3x + 3$

$$\frac{d}{dx} = 3x^2 - 3 = 3(x^2 - 1)$$



$$y' = 3x^2 - 3$$

$$y'' = 6x$$

Sign chart for the second derivative $y'' = 6x$:

Interval	Sign of y''
$x < 0$	-
$x > 0$	+

1st $\frac{d}{dx}$ testcritical points = potential rel. max or min

+ = function is increasing

- = function is decreasing

2nd $\frac{d}{dx}$ test

undefined or 0 = potential inflection points

+ = slope is increasing

- = slope is decreasing

+ = concave up

- = concave down

-1 = rel. max

1 = rel. min

#4 a, b
pg. 305

sign of y' :



Hi

Will!!!

Problems that if you ain't practice I highly recommend
pg. 306 doing - AKA "homework"

7-11 odd
21, 23

Do 1st & 2nd derivative tests to
find rel max, min, & inflection points

I ♥ U

Master
tests
later

Hey

Finding Relative Maximum & Minimum

first derivative

increasing

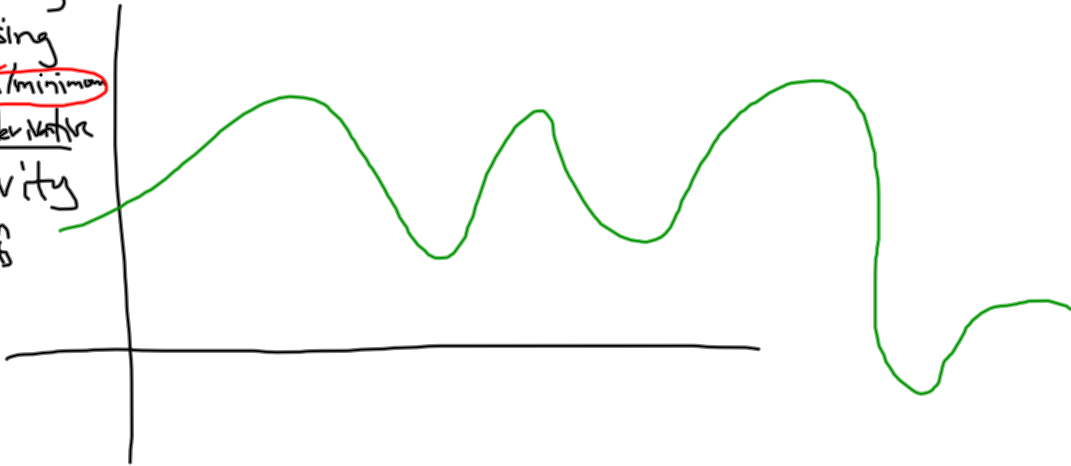
decreasing

maximum/minimum

second derivative

concavity

inflection
point



$$f(x) = y = x^2 + 4x + 4$$

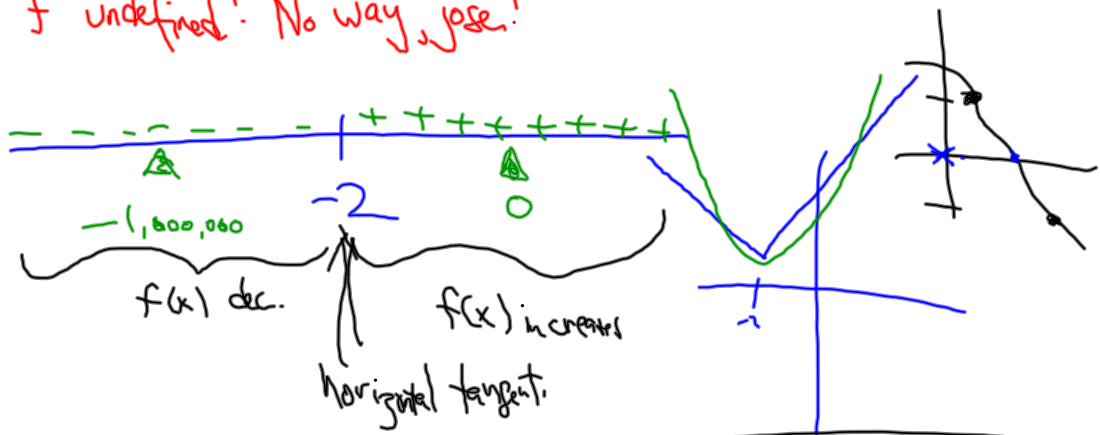
$$y' = f'(x) = \frac{dy}{dx} = 2x + 4$$

$$= 2(x + 2)$$

$$a) f' = 0 \Rightarrow 2(x + 2) = 0 \Rightarrow x = -2$$

b) f' undefined? No way, Jose!

sign of y' :



$$f(x) = x^2 + 4x + 4$$

$$f'(x) = 2x + 4 = 2(x + 2)$$

$$f''(x) = 2$$

$$a) f'' = 0 \text{ No}$$

$$b) f'' \text{ und No}$$

+++++

Concave-up.

1st derivative test

1) take first derivative

2) identify critical points

$$a) f' = 0$$

b) f' undefined

3) create sign chart

2nd derivative test

1) find $\frac{d^2y}{dx^2}$

2) find potential inflection pts

$$a) f'' = 0$$

b) f'' undefined

3) sign chart

2a) $y' = 0 \Rightarrow x = 4$
2b) y' always defined

sign of y' : $++++0++++$
4
always increasing

$$y' = 3x^2 - 24x + 48$$

$$y'' = 6x - 24 = 6(x - 4)$$

Potential inflection pts

② $y'' = 0 \Rightarrow x = 4$

⑥ y' always defined

Sign of γ_i

-----|++++

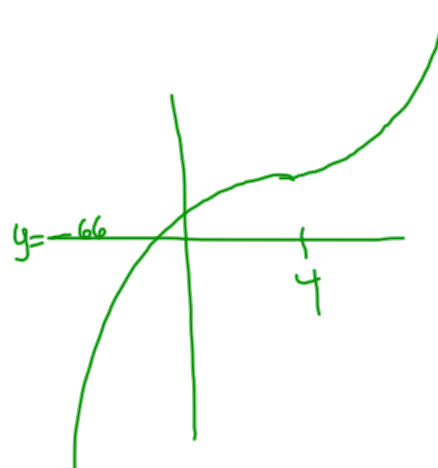
~~~~~|~~~~~

C-down C-up

- 1) find  $f'(x)$
- 2) find critical pts
  - a)  $f' = 0$
  - b)  $f'$  undefined
- 3) sign chart

### Second derivative Test

- 1) find  $f''(x)$
- 2) find potential inflection points
  - a)  $f'' = 0$
  - b)  $f''$  undefined
- 3) sign chart





5.2/3a,b a)  $f(x) = 3x^2 - 6x + 1$

$$f'(x) = 6x - 6 = 6(x-1)$$

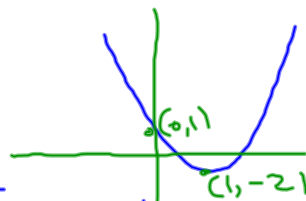
a)  $x = 1$

b) —

sign of  $f'$ : — — — | + + +

$$f''(x) = 6$$

+ + + + +



rel min @  $x = 1$

$$f(1) = 3 - 6 + 1 = -2$$

5.2 examples

2010-12-02 Pd 3